

DESCRIPTIONDishwasher with a device for storage of rinsing water

5 [001] The invention relates to a dishwasher with a device for storage of rinsing water and a method for storage of rinsing water.

[002] In a dishwasher washing processes are carried out according to a wash program generally consisting of the partial program steps, "pre-wash", "clean", "intermediate rinse",
10 "clear rinse" and "dry" in order to clean the items to be washed located in the dishwasher. In order to achieve the best possible cleaning effect, a pre-wash is generally provided in the washing program consisting of several partial program steps. The coarse contaminants are first removed from the items to be washed by means of a first rinsing water and removed with the first rinsing water from the dishwasher after the end of the pre-wash process. Fresh water
15 is then supplied to the dishwasher to carry out further partial program steps, e.g. cleaning, using new rinsing water.

[003] Known from DE 297 06 153 U1 is a dishwasher comprising a water storage device and condensation drying. Heated water from the last after-rinse is stored in a storage reservoir as a
20 water store and supplied subsequently to the washing chamber of the dishwasher. The crockery is dried according to the condensation principle. Air is sucked from the washing container by a fan via a suction pipe and is passed via a condenser with a delivery pipe into the storage reservoir. In the storage reservoir the air is heated again after being cooled in the condenser and is supplied to the washing chamber again.

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[004] Known from DE 39 13 355 A1 is a washing machine or dishwasher comprising a device for intermediate storage of used washing and/or rinsing solution for re-use as a later time. The duration of the intermediate storage is registered in time and when a preset time interval is achieved or exceeded, either a display or a signal is triggered or the lye pump is operated by
30 means of the control device for conveying the intermediately stored washing and/or rinsing solution into the outflow.

[005] DE 42 43 605 of the application discloses a method for operating a dishwasher and a dishwasher for carrying out the method. At the end of the partial program step intermediate rinse the rinsing solution is withdrawn from the washing container, stored in a storage reservoir and returned in to the washing container in the following wash program in the first partial program step. A disadvantage here is that the storage reservoir does not adapt to the spatial relationships which causes an unnecessary loss of space. In addition, an expensive ventilation device is required for the storage reservoir.

[006] It is thus the object of the present invention to provide a dishwasher and a method for operating a dishwasher wherein the storage reservoir for the rinsing water is particularly simple and economical to produce and on the other hand, the loss of space in the dishwasher through the storage reservoir is kept very low and/or the rinsing solution can be stored for a particularly long time in the storage reservoir without substantial formation of bacteria.

[007] The object is solved according to the present invention by a dishwasher having the features of claims 1 and 16 and by a method having the features of claims 17 and 21. Advantageous further developments of the present invention are characterised in the dependent claims 2 to 15 and 18 to 20.

[008] According to the invention, in a dishwasher which is suitable for carrying out a washing program comprising at least one washing process using rinsing water, comprising a program controller, a washing container for receiving the items for be cleaned and a system for circulating the rinsing water and a storage reservoir for rinsing water for storage and re-use at a later time of at least a part of the rinsing water present in the dishwasher, the storage reservoir is embodied as a film bag which can be matched in size to the volume of the liquid. As a result, any free space in a dishwasher can advantageously be used for storage of rinsing water. No unnecessary loss of space therefore arises as a result of the storage of rinsing water. This type of flexible film bag is inexpensive and simple to manufacture, and assembly or manufacture of the dishwasher is simple.

[009] Appropriately the film bag is formed preferably of plastic or metal. Thus, plastic in particular is a very inexpensive material so that the film bag according to the invention is particularly cheap to manufacture.

5 [010] The film bag is preferably embodied so that it can hold several sets of rinsing water, preferably two sets of rinsing water. The film bag according to the invention can thus advantageously be used to store rinsing water for a plurality of partial program steps within a washing program.

10 [011] In a further embodiment, the dishwasher has a lye pump for pumping away the rinsing water from the dishwasher and a circulating pump for acting upon the spray arms and the film bag can be filled with rinsing water via a first rinsing water pipe from the lye pump. Thus, the lye pump can be used for filling the film bag.

15 [012] In an additional embodiment, a water deflector valve is provided which either opens the first rinsing water pipe when the shut-off valve from the lye pump to the film bag is opened or a second rinsing water pipe from the lye pump to the waste water pipe which is preferably closed by means of a shut-off valve. Thus, a single water deflector valve can advantageously be used to control whether the lye pump conveys rinsing water into the waste water pipe or
20 into the film bag.

[013] Appropriately, the rinsing water is passed from the film bag via a third rinsing water pipe for re-introduction of rinsing water into the rinsing water cycle of the dishwasher, which preferably leads from the film bag into a pump sump in the lower area of the washing
25 container. Consequently, rinsing water can be re-introduced from a third rinsing water pipe independently of the filling.

[014] Appropriately, the first rinsing water pipe and/or the second rinsing water pipe and/or the third rinsing water pipe can each be closed by means of a shut-off valve. Thus, all the
30 rinsing water pipes can advantageously be opened and closed separately and independently of one another, therefore also the filling and emptying of the film bag and the removal of rinsing water into the waste pipe.

[015] In a further advantageous embodiment, the dishwasher has a lye pump for pumping away the rinsing water from the dishwasher and a circulating pump for acting upon the spray arms and the filter bag can be filled with filtered rinsing water by means of a filter system in the pump sump and by means of a first rinsing water pipe from the circulating pump. By using the circulating pump for filling the film bag, filtered rinsing water is introduced into the film bag as a result of the arrangement of the suction pipe to the circulating pump in the pump sump. As a result, fewer impurities occurs in the rinsing water pipes and in the film bag. In addition, less algae and bacteria growth occurs. The rinsing water can thus be stored in the film bag over a fairly long time, e.g. a few months.

[016] Appropriately, a first rinsing water pipe can be closed by a shut-off valve and a water deflector valve is provided which either releases one, both or none of the spray arms for acting upon with water. The filling of the film container can thereby be controlled by the circulating pump.

[017] Advantageously, the rinsing water from the film bag for re-introduction of rinsing water can be passed via a first rinsing water pipe when the shut-off valve is opened via the switched-off circulating pump into a pump sump. Thus, advantageously only one rinsing water pipe is required for filling and emptying the film bag.

[018] Appropriately, the operation of the lye pump and/or the circulating pump and the actuation of the shut-off valves is controlled by means of the preferably electronic program controller.

[019] In a further embodiment, the film bag is arranged between an outer wall of the dishwasher and a side wall of a washing container of the dishwasher. A free space between the outer wall and the side wall of the washing container is therefore used for storage of rinsing water.

[020] Advantageously, the film bag is arranged between a top wall of the dishwasher and a top wall of the washing container. Thus, this free space can also be used for storage of rinsing water.

5 [021] Appropriately, the film bag has at least one opening for introducing or removing rinsing water which preferably opens into the first rinsing water pipe.

[022] In a further variant, the flexible film bag and/or the rinsing water pipes are coated on the water-guiding side at least in part with an anti-bacterial agent, e.g. with Agion. The growth of
10 bacteria and algae is thereby restricted so that the rinsing water can be stored for a longer time and deposits and impurities are prevented. The operational safety can thus be enhanced because impurities, for example, do not impede the operation of shut-off valves or pumps.

[023] In another dishwasher according to the invention which is suitable for carrying out a
15 washing program comprising at least one washing process using rinsing water, comprising a program controller, a washing container for receiving the items for be cleaned and a system for circulating the rinsing water and a storage reservoir for rinsing water for storage and re-use of at least a part of the rinsing water present in the dishwasher at a later time, and the dishwasher has a lye pump for pumping away the rinsing water from the dishwasher and a
20 circulating pump for acting upon the spray arms, wherein the storage reservoir can be filled with filtered rinsing water from the circulating pump.

[024] In a method according to the invention for operating a dishwasher, the rinsing water present in the dishwasher at the end of or during a washing process is removed at least partly
25 from the rinsing water circuit of the dishwasher and introduced into a flexible film bag, which is matched in its size to the liquid volume and before or at the beginning of a following rinsing process is removed at least partly from the flexible film bag and fed back to the rinsing water cycle of the dishwasher. Thus, any free space in a dishwasher can advantageously be used for storing rinsing water. NO unnecessary loss of space therefore arises as a result of the
30 storage of rinsing water. This type of flexible film bag is cheap and simple to manufacture and simple when assembling or manufacturing the dishwasher.

[025] In a further variant in a method for operating a dishwasher, the rinsing water present in the dishwasher at the end of or during a clear rinse partial program step of a washing program is removed at least partly from the rinsing water circuit of the dishwasher and introduced into the flexible film bag, which is matched in its size to the liquid volume and before or at the beginning of a pre-wash partial program step of a following washing program is removed at least partly from the flexible film bag and fed back to the rinsing water cycle of the dishwasher. Thus, particularly clean rinsing water is intermediately stored in the film bag and used in a pre-wash partial program step in which a few impurities in the rinsing water are of no importance.

[026] Appropriately, the rinsing water is fed back into the rinsing water cycle of the dishwasher before or at the beginning of the intermediate rinse partial program step.

[027] Appropriately, the rinsing water fed back into the rinsing water cycle of the dishwasher from the flexible film bag is used exclusively for cleaning the washing container of the dishwasher.

[028] In a further embodiment of the method, the rinsing water present in the dishwasher is removed at least partly from the pump sump by means of the circulating pump via the filter system of the dishwasher provided there and filtered in the film bag. By using the circulating pump for filling the film bag, as a result of the arrangement of the suction pipe to the circulating pump in the pump sump, filtered rinsing water is introduced into the film bag. As a result, fewer impurities occur in the rinsing water pipes and in the film bag and less growth of algae and bacteria is the consequence. The rinsing water can thus be stored in the film bag without any problems for a longer period, e.g. several months.

[029] In another method according to the invention for operating a dishwasher, the rinsing water present in the dishwasher at the end of or during a washing process is at least partly removed from the rinsing water cycle of the dishwasher and introduced into a storage reservoir and before or at the beginning of a following rinsing process, is removed from the storage reservoir at least in part and is fed back to the rinsing water cycle of the dishwasher wherein the storage reservoir is filled with filtered rinsing water from the circulating pump.

[030] The present invention is explained in detail hereinafter using preferred exemplary embodiments with reference to the appended drawings. In the figures:

5 [031] Figure 1 is a perspective view of a dishwasher according to the invention, according to one embodiment of the present invention,

[032] Figure 2 is a perspective view of a dishwasher according to the invention, according to a further preferred embodiment of the present invention,

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[033] Figure 3 is a schematic diagram to show the method according to the invention in a first embodiment of the present invention for operating a dishwasher according to the invention and

15 [034] Figure 4 is a schematic diagram to show the method according to the invention in a second embodiment of the present invention for operating a dishwasher according to the invention.

[035] The dishwasher 9 according to the invention shown in Figure 1 comprises a washing
20 container 11 into which two crockery baskets 12 for receiving the items to be cleaned, can be slid in a drawer-like manner. The dishwasher 9 has a hinged door 13 at its front which can be opened out into a horizontal position for loading the crockery baskets 12. In the operating state, the crockery baskets 12 are slid into the washing container 11 and the hinged door 13 is closed. In this embodiment of the dishwasher 9 according to the invention, a storage reservoir
25 17 for rinsing water is accommodated between an outer wall (not shown) of the dishwasher 9 and a side wall 14 of the washing container 11, preferably affixed to the side wall 14 of the washing container 11.

[036] Using the dishwasher 9 shown in Figure 1, a method for operating a dishwasher
30 according to the present invention can be carried out wherein in a first step the rinsing water present in the dishwasher 9 during an arbitrary partial program step of a wash program of a washing process is removed at least partly from the rinsing water circuit of the dishwasher 9

and introduced into a flexible film bag 17, and in a second step the rinsing water held in the film bag 17 is removed at least partly from the flexible film bag 17 in a following washing process before or at the beginning of an arbitrary partial program step of the wash program in a following washing process and is fed back to the rinsing water cycle of the dishwasher 9. In this case, the film bag 17 clamped between the outer wall or another limiting device, e.g. a grid (not shown) and a side wall 14 of the washing container 11 so that the flexible film bag 17 is optimally matched to the space between the outer wall or another limiting device and the side wall of the washing container 11, i.e., completely utilises said space.

[037] The film bag 17 is filled and emptied by means of at least one opening 15 in the film bag 17. In order to ensure that the film bag 17 is completely filled and emptied, the opening 15 for introducing or removing rinsing water is provided in the lower area of the film bag 17. In this way, any washing residues entrained in the rinsing water which can deposit in the film bag 17 during storage of the rinsing water can be carried away when the rinsing water is removed from the film bag 17. The filling and possibly the emptying of the rinsing water from the film bag 17 is accomplished by means of a pump, preferably utilising the pumping capacity of the circulating pump (not shown) or lye pump (not shown) of the dishwasher 9.

[038] The dishwasher 9 according to the invention shown in Figure 2, having a hinged door 13, has a film bag 17 as a store for the rinsing water. The film bag 17 lies on the top wall 18 of the washing container 11 and is thus located in the free space (not shown) between the top wall 16 of the dishwasher 9 and the top wall 18 of the washing container 11. The film bag 17 generally has holders integrated in the film bag 17 with which the film bag 17 can be affixed very simply to the dishwasher during assembly (not shown). The film bag 17 has an opening 15. It is especially advantageous for the use of the film bag 17 that this is very inexpensive to manufacture and on the other hand, it can be adapted to the spatial relationships as a result of its flexible properties. The adaptability of the film bag 17 according to the invention to the volume of the stored rinsing water and to the spatial relationships preferably results from the mobility of the film and/or the expandability of the film. The available free space can thus be optimally utilised. Furthermore, no ventilation is required since the flexible film bag 17 adapts to the varying volume of rinsing water. The film bag 17 can receive several sets of rinsing water, preferably two sets of rinsing water. The film bag can be arranged at any location in the

dishwasher with free space, e.g below the washing container 11 or at a rear wall of the washing container 11. The shape of the free space is also arbitrary, the film bag 17 merely needs to have a suitably matched shape.

5 [039] Figure 3 is a schematic diagram showing the method in a first embodiment of the present invention for operating a dishwasher according to the invention. In this embodiment of the method according to the invention, the lye pump is used to fill the film bag 17 with rinsing water. The film bag 17 is filled via a first rinsing water pipe 1 from the lye pump to the film bag 17, the lye pump receiving the rinsing water from the pump sump at the bottom
10 of the washing container 11.

[040] A second rinsing water pipe 2 in Fig. 3 leads from the lye pump to a drain pump via which rinsing water is conveyed from the dishwasher 9. The drain pipe has a return shut-off valve 5 to prevent any return of used rinsing water from the drain pipe into the dishwasher 9.
15 In order to better control the flow paths through the rinsing water pipes 1, 2, 3, a shut-off valve 6, 7, 8 is provided in each of the rinsing water pipes 1, 2, 3, which opens or closes the relevant rinsing water pipe 1, 2, 3 as required. The shut-off valve 7 in the first rinsing water pipe 1 between the lye pump and the film bag 17 is used in particular to prevent any undesired return of rinsing water from the filled film bag 17 via the lye pump back into the pump sump.
20 When using an intake pipe which ends in the upper area of the storage reservoir, the shut-off valve 7 is not required (not shown). The film bag 17 is generally emptied into the washing container 11 or into the drain pipe 5 by means of gravity by means of a corresponding control by at least one shut-off valve or a water deflector valve. The shut-off valve can also be integrated on the continuous heater.

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[041] However, the flow paths of the rinsing water can also be controlled by a water deflector valve 4 which either opens the first rinsing water pipe 1 from the lye pump to the film bag 17 or the second rinsing water pipe 2 from the lye pump to the drain pipe. In this way, during operation of the lye pump the film bag 17 is either filled with rinsing water via the first rinsing
30 water pipe 1 or rinsing water is conveyed via the second rinsing water line 2 from the dishwasher 9 into the drain pipe.

[042] The rinsing water from the film bag 17 is re-introduced into the rinsing water cycle of the dishwasher 9 via a third rinsing water line 3 which leads from the film bag 17 to the pump sump in the lower area of the washing container 11. In the pump sump the rinsing water is conveyed back into the rinsing water cycle with spray arms by a circulating pump. The operation of the lye pump, the circulating pump and the actuation of the water deflector valve 4 and the shut-off valves 6, 7, 8 is coordinated and controlled electronically by means of an electronic program controller (not shown).

[043] The schematic diagram shown in Fig. 3 to represent the method can be modified by the film bag 17 having only one opening and thus attaching one rinsing water pipe wherein the first rinsing water pipe 1 and the second rinsing water pipe 2 are combined to form one rinsing water pipe. At the end of this common rinsing water pipe it is then necessary to have a branch to the shut-off valves 7, 8 (not shown). Furthermore, the film bag 17 can be filled and emptied using any other device suitable for this purpose or any other method.

[044] Figure 4 is a schematic diagram showing the method in a second embodiment of the present invention for operating a dishwasher according to the invention. In this embodiment of the method according to the invention, the circulating pump is used to fill the film bag 17 with rinsing water. The film bag 17 is filled via a first rinsing water pipe 1 when the shut-off valve 7 is open from the circulating pump to the film bag 17, where the circulating pump obtains the rinsing water from the pump sump at the bottom of the washing container 11. When the shut-off valve 7 is closed, the rinsing water is fed via the water deflector valve 4 into the spray arms. The flow resistance of the spray arms when the shut-off valve 7 is opened is sufficient to fill the film bag 17. For this reason, no additional shut-off valve (not shown) directly before the water shut-off valve 4 or closure of the water deflector valve 4 is required to fill the film bag 17.

[045] As a result, filtered rinsing water is pumped into the film bag 17 in a particularly advantageous manner. The rinsing water sucked into the pump sump by the circulating pump is filtered by a filter system normally disposed in the pump sump, generally consists of a plurality of filters, e.g. a coarse and a fine filter because the suction pipe of the circulating pump in the pump sump is differently configured from the suction pipe of the lye pump. As a

result, the residence time of the rinsing water in the film bag 17 can be extended and no deposits or only very few deposits occur in the film bag 17 and/or in the rinsing water pipe 1. Thus, blockages caused by deposits in the rinsing water pipes 1 and/or in the shut-off valve 7 can be avoided. In addition, the growth of bacteria, germs and algae is substantially restricted because food is withdrawn from these organisms. The film bag 17 is generally emptied into the washing container 11 or into the drain pipe 5 by gravity as a result of opening the shut-off valve 7. When the shut-off valve 7 is open, the rinsing water runs back via the rinsing water pipe 1 through the switched-off circulating pump back into the pump sump preferably as a result of gravity.

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[046] The operation of the lye pump, the circulating pump and the actuation of the water deflector valve 4 and the shut-off valve 1 is coordinated and controlled by the electronic program controller.

15 [047] In addition to being preferably used for a pre-wash process of a following cleaning program, the rinsing water stored in the film bag 17 can also be used for an intermediate flush (cleaning the filter by short-term alternating operation of the lye and circulating pump).

20 [048] The film bag 17 and/or the rinsing water pipes 1, 2, 3 can have an anti-bacterial coating on the water-guiding inner walls, e.g. with Agion. As a result, significantly fewer bacteria or germs deposit on the inner walls of parts 1, 2, 3, 6, 7, 8, 17. As a result, the residence time of the rinsing water in the film bag 17 can be increased and blockages of the rinsing water pipes 1, 2, 3 by deposits can be avoided.

25 [049] All the features of the invention specified above for a dishwasher according to the invention and the method according to the invention with a flexible film bag (claim 1 and 17) also apply to a dishwasher according to the invention and the method according to the invention with a non-flexible storage reservoir (claims 16 and 21) where the storage reservoir can be filled or is filled with filtered rinsing water from the circulating pump.

[050]	Reference list
[051]	1 Rinsing water pipe between pump and storage reservoir
[052]	2 Rinsing water pipe to drain pipe
[053]	3 Rinsing water pipe between film bag and pump sump
[054]	4 Water deflector valve
[055]	5 Return shut-off valve in drain pipe
[056]	6 Shut-off valve in rinsing water pipe 2
[057]	7 Shut-off valve in rinsing water pipe 1
[058]	8 Shut-off valve in rinsing water pipe 3
[059]	9 Dishwasher
[060]	11 Washing container
[061]	12 Crockery baskets
[062]	13 Hinged door of dishwasher 9
[063]	14 Side wall of washing container 11
[064]	15 Opening in storage reservoir 10
[065]	16 Top wall of dishwasher 9
[066]	17 Film bag
[067]	18 Top wall of washing container 11